

# Mercury Alert

## Antique Mirrors

Elemental Services and Consulting, Inc. (ESCO) was retained to obtain mercury vapor concentrations from an antique dresser with attached mirror. The owner of the dresser upon learning that mercury was used in making mirrors decades ago was concerned that mercury vapor was contaminating their home.

Ambient air temperature within the home was 72° F with windows open to outdoors.

Ambient air sampling was performed using the Lumex® RA-915 *Light*. This instrument is a portable mercury vapor analyzer and is designed for quantitative determination of mercury vapor in ambient air. This instrument includes a built in test cell for field performance verification.

Before ambient air testing, ESCO tested this instrument's serviceability test mode. The instrument's operation manual states that an R-value less than 25 percent shows that the instrument is operating properly. This instrument indicated an R-value of 18. After performing this serviceability test, this instrument was allowed to warm-up for approximately 10 minutes.

Air concentrations within the home were 0.0  $\mu\text{g}/\text{m}^3$  of air. Air concentrations within the bedroom where the dresser was located were also 0.0  $\mu\text{g}/\text{m}^3$ . The wooden frame that held the mirror to the dresser indicated mercury vapor concentrations of 2.3  $\mu\text{g}/\text{m}^3$ .

The owners attempted to remove the mirror from the frame in order to replace it and discovered a bead of mercury during the removal process (see photo).

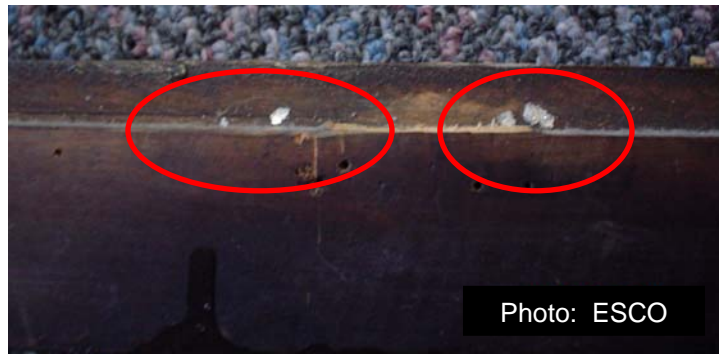


Mercury vapor concentrations following the recovery of the mercury were 0.9  $\mu\text{g}/\text{m}^3$  in the breathing zone, but rapidly dissipated with ventilation to outdoors. The carpeted floor indicated mercury vapor concentrations of 0.5  $\mu\text{g}/\text{m}^3$  – 0.8  $\mu\text{g}/\text{m}^3$  for nearly 2 hours until ventilation to outdoors was complete. Mercury

vapor concentrations the following day indicated  $0.0 \mu\text{g}/\text{m}^3$  in the breathing zone and at floor level.

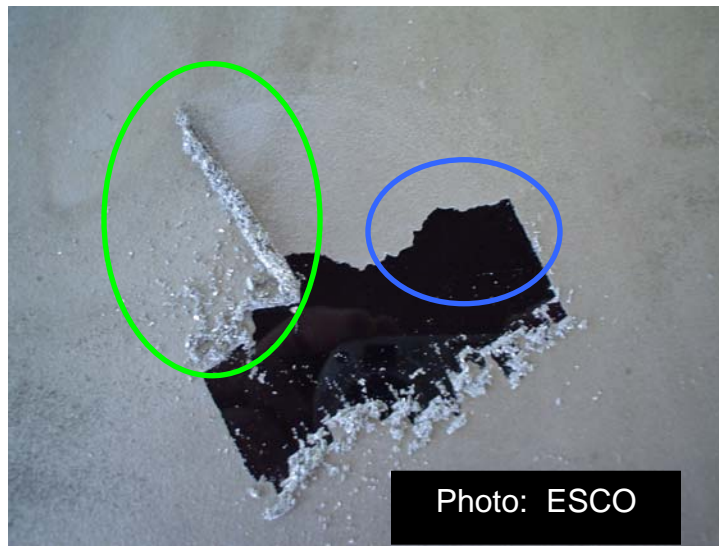
Additionally, flakes of the silver backing were observed around the bevel of the wood holding the mirror in place. Several flakes of silver backing were discovered behind the dresser in the bedroom (see following photograph).

The mercury vapor concentration in the area of these flakes was  $> 100 \mu\text{g}/\text{m}^3$ .



The following photograph shows how the tin amalgam behaves when scraped off the glass. Note how there are crisp edges at the leading edge (blue). Also note when the removed amalgam is pushed together, it binds quite readily (green).

Mercury vapor concentrations of this amalgam were  $>100 \mu\text{g}/\text{m}^3$ .



The following photograph shows the detail where braces held the mirror within the frame. It is believed that these areas are where the flakes came from that were observed in the frame and on the floor below the dresser.



Photo: ESCO

### **Brief History of Tin Mirrors**

At the end of the Middle Ages this type of producing mirrors with liquid metals, did evolve into the production of mercury mirrors. The metal used was in fact an amalgam of tin and mercury. A method of backing a plate of flat glass with a thin sheet of reflecting metal came into widespread production in Venice during the 16th century.

The reflecting layer of mercury on mirrors, which were made throughout a period of 400 years, existed out of 75% of tin and approximately 25% mercury. The name 'tin mirror' therefore would be more appropriate. Technically spoken, it was neither one of them. The metal used was in fact an amalgam of tin and mercury.

Producing a mirror was a complicated and delicate process. On top of that, the production was very unhealthy, due to the fact that mercury fumes are very toxic. This type of mirrors therefore is no longer made.

Mercury mirrors were moreover well resistant against all kinds of influences. Very old mirrors of this kind still are surprisingly well preserved. Sometimes a crystallization of amalgam can be found on the lower part of the mirror, that side on which it stood to let the redundant mercury flow off.

From: [http://vision2form.nl/mirror\\_history.html](http://vision2form.nl/mirror_history.html)

## **Discussion**

Although mercury vapor concentrations within the home were  $0.0 \mu\text{g}/\text{m}^3$  during the initial survey, it is possible that during winter months when the house is closed and the furnace running, the mercury vapor concentrations may increase.

Should this mirror break, it is likely that mercury vapor concentrations would exceed ATSDR's recommended guidelines for Residential Occupancy Levels (ROL).

Additionally, when moving this furniture, it is likely that mercury contamination would unknowingly be spread to other areas of the home.

Another important issue regarding antique mirrors is resurfacing. Mirror resurfacing workers should be made aware of the hazards associated with mercury vapor.

Other possible sources of mercury within a home, in addition to "silvered" mirrors, include pendulum clock counterweights, "silvered" vases, some fishing lures, electrical components, some natural gas regulators, barometers, thermometers (fever, cooking, etc.), some appliance components, some light bulbs, float switches and thermostats.

## **Rationale For Mercury Vapor Levels**

Safe indoor mercury vapor levels (recommended) have been established by the Agency for Toxic Substances and Disease Registry (ATSDR) and are generally accepted and used by local health departments and Ohio Environmental Protection Agency (EPA). The following table shows these levels as published by ATSDR in December 2000.

<b>Indoor Air Concentration</b>	<b>Action Level</b>	<b>Setting</b>
$<1.0 \mu\text{g}/\text{m}^3$	Residential occupancy level	Residential Setting
$10 \mu\text{g}/\text{m}^3$	Isolate residents from exposure	Residential Setting
$3.0 \mu\text{g}/\text{m}^3$	Based on residential occupancy level but adjusted for the shorter duration exposures typical of most workplaces	Occupational Setting

Mercury Alert provided by:

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